

Candidate Name	Centre Number	Candidate Number

WELSH JOINT EDUCATION COMMITTEE
General Certificate of Education
Advanced



CYD-BWYLLGOR ADDYSG CYMRU
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314/01

BIOLOGY

MODULE BI4

A.M. MONDAY, 24 January 2005

(1 hour 40 minutes)

For Examiner's Use Only

Total Marks	
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INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

The quality of written communication will affect the awarding of marks.

No certificate will be awarded to a candidate detected in any unfair practice during the examination.

1. Answer questions (a), (b) and (c) in the spaces provided.

(a) State **one** use of monoclonal antibodies. [1]

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(b) (i) State **one** reason for the increase in antibiotic-resistant bacteria, such as MRSA. [1]

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(ii) How can antibiotic resistance be spread from one species of bacterium to another? [1]

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(c) German measles (Rubella) can adversely affect the development of a fetus. Children are vaccinated against Rubella, to prevent it becoming a problem. Originally, only teenage girls were vaccinated.

Why is it preferable that boys should also be vaccinated? [1]

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(Total 4 marks)

2. (a) Complete the following table, using a tick (✓) to indicate which type of immunity is shown by each of the following circumstances. [4]

	<i>Active natural</i>	<i>Active artificial</i>	<i>Passive natural</i>	<i>Passive artificial</i>
Exposure to measles				
Receiving MMR vaccine				
Receiving anti-rabies injection				
Transfer of antibodies from mother to child in breast milk				

- (b) Explain why passive immunity is not as long lasting as active immunity. [2]

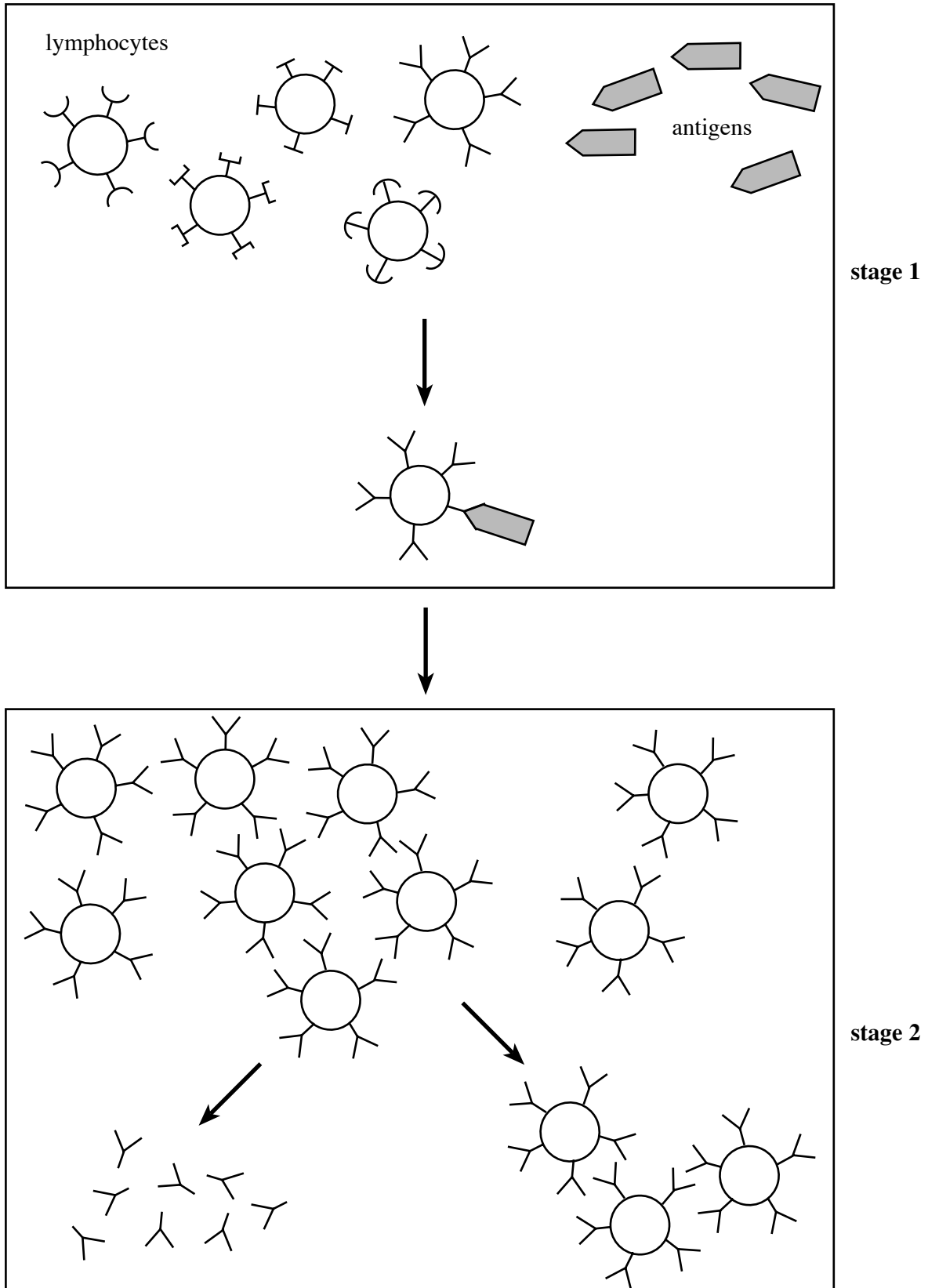
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- (c) The diagram shows one type of immune response that occurs when the body is exposed to an antigen.



Explain what is happening during this type of response in

(i) stage 1;

[3]

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(ii) stage 2.

[4]

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(Total 13 marks)

3. Physical or mechanical digestion is an important aspect of digestion as food passes through the alimentary canal.

- (a) (i) State the **two** main areas of the alimentary canal where mechanical breakdown occurs. [1]

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- (ii) Why is mechanical breakdown important? [1]

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- (b) Bile is released into the small intestine where it is mixed with the contents. Bile contains bile salts.

In an experiment, lipase was added to a mixture of water and olive oil and the pH of the mixture was monitored at regular intervals. The experiment was repeated, under the same conditions, but with bile salts. The results are shown in the table below.

	<i>pH</i>	
<i>Time / min</i>	<i>Lipase</i>	<i>Lipase and bile salts</i>
1	8.0	8.0
2	7.8	7.4
3	7.4	6.8
4	7.1	6.3
5	6.8	5.9
6	6.6	5.9

- (i) Explain why lipase causes a drop in pH. [1]

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.....

- (ii) Explain the more rapid drop in pH when bile salts are present. [2]

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- (iii) State **one other** function of bile in the small intestine. [1]

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- (c) The digested products of carbohydrates, lipids and proteins are absorbed into the villi of the ileum.

Outline how **each** of these products is transferred into the **bloodstream**.

[5]

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- (d) Obesity is a major health concern, in the western world including Wales.

Explain how an excess of **all** the absorbed digested products can lead to an increase in body mass.

[2]

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(Total 13 marks)

4. ATP is a compound that is described as *the universal energy currency in living organisms*.

(a) (i) Using the structure of ATP, explain what is meant by the phrase *energy currency*. [4]

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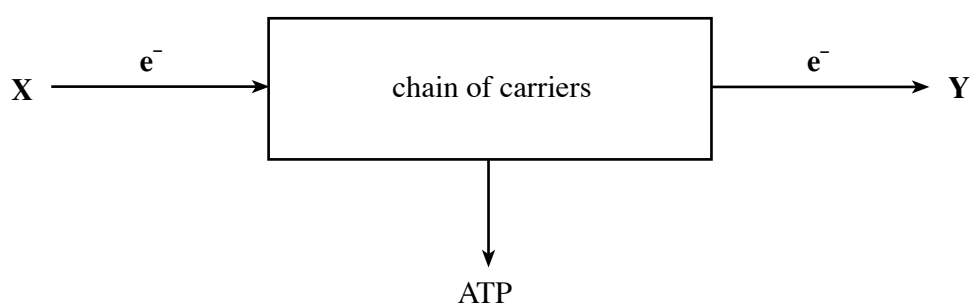
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(ii) Give **two** examples of the use of ATP. [1]

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(b) A diagram summarising the role of the electron transport system in ATP production is shown below.



This process takes place during both respiration and photosynthesis.

State the electron donor (**X**) and the final electron acceptor (**Y**) during

(i) respiration;

[2]

X

Y

(ii) photosynthesis.

[2]

X

Y

(c) As the electron is transferred along the electron transport chain, energy is made available for ATP formation.

Explain how this energy is used to produce ATP.

[4]

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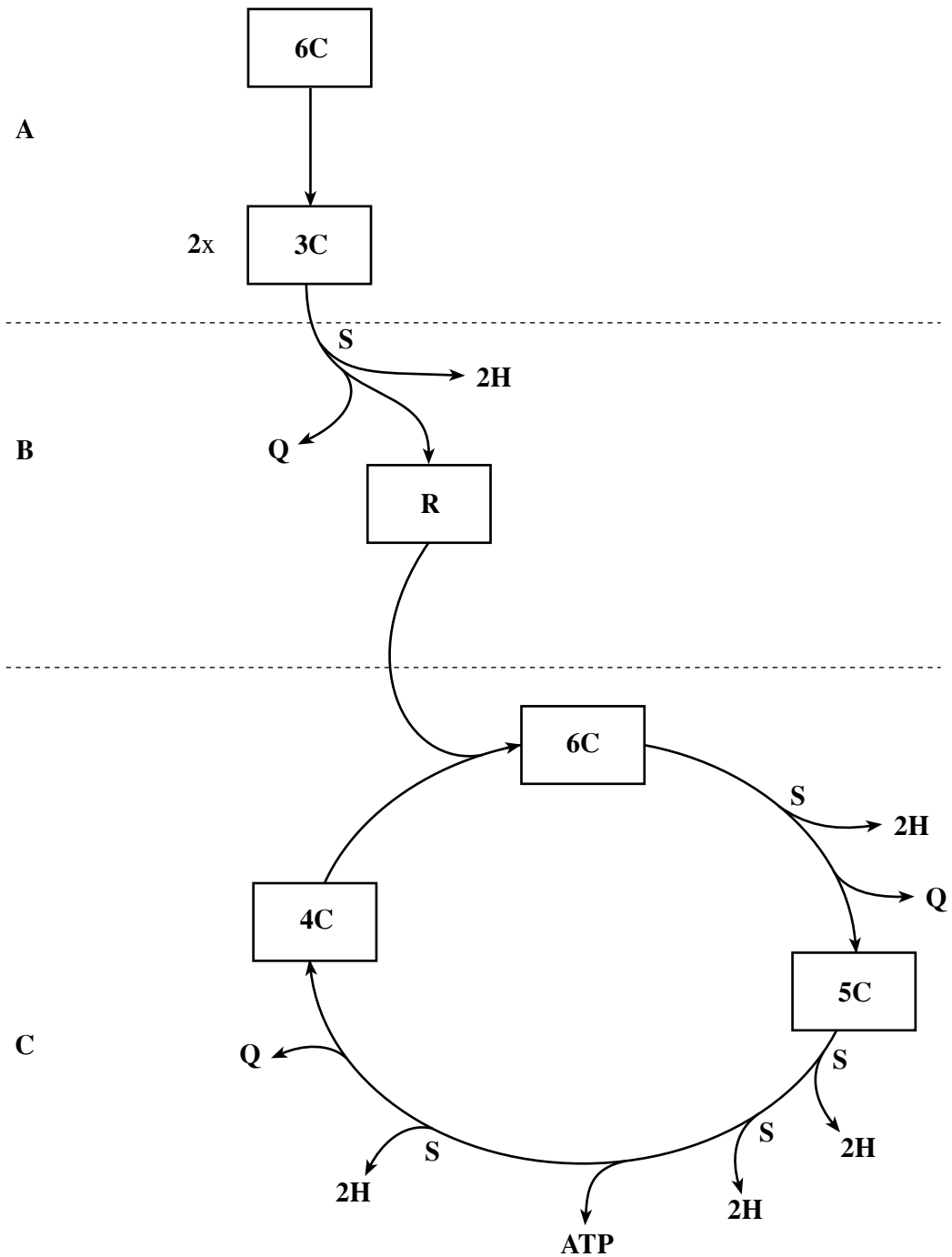
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(Total 13 marks)

5. The diagram shows an outline of the stages of aerobic respiration, labelled A, B and C.



(a) Complete the table.

[6]

<i>Stage</i>	<i>Name of process</i>	<i>Precisely where it occurs</i>
A		
B		
C		

(b) Identify

(i) substance **Q**;

[1]

.....

(ii) substance **R**.

[1]

.....

(c) State the **type** of enzyme responsible for the reactions labelled **S**.

[1]

.....

(d) ATP is produced in both aerobic and anaerobic respiration.

(i) State the **net** yield of ATP in **aerobic** respiration.

[1]

.....

(ii) Under aerobic conditions, state which of the stages, **A**, **B** or **C** can lead to the greatest ATP production.

[1]

.....

(iii) Explain why anaerobic respiration produces less ATP than aerobic respiration.

[3]

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(Total 14 marks)

6. Three students were carrying out an experiment in which bacteria were cultured in a liquid. A sample of the bacteria was stained purple by the Gram stain.

(a) What does the staining indicate about the structure of the bacterial cell wall? [2]

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(b) In order to monitor population growth, a number of different methods may be used.

One student suggested using a **viable** count.

(i) What assumption must be made when using this method? [1]

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(ii) State **one** limitation of using this method. [1]

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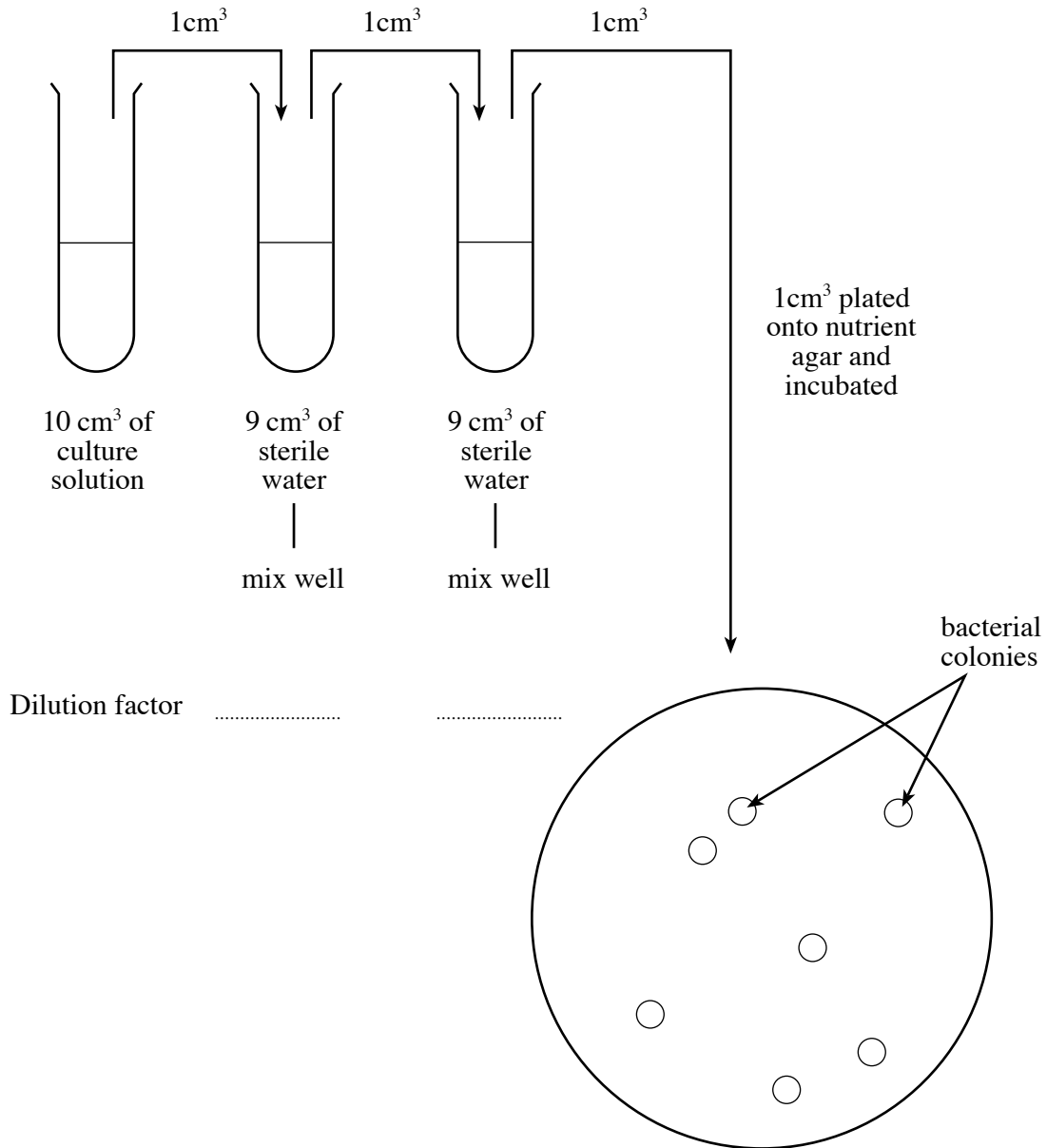
(c) Another student used a **total** count method. He counted all the bacteria in the field of view of the microscope.

Suggest why this method gave a higher estimate of the population than the viable count. [1]

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- (d) In both methods the original culture must be diluted before a count can be made.

The diagrams below show how a dilution was carried out and the result of incubating 1cm^3 of the diluted sample on a nutrient agar plate for 24 hours.



Using this information, complete the dilution factors and calculate the estimated total population in 1cm^3 of the original culture.
Show your working. [3]

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- Or** (b) Explain the effects of limiting factors on the rate of photosynthesis. [10]

[illegible]

[illegible]

(0006/7)

[illegible]